REMARKS

Claims 1-12 are now in this application, and are presented for the Examiner's consideration.

Request for Three Month Extension of Time

Applicant hereby requests that the period for responding to the Office Action mailed September 11, 2002, set to expire on December 11, 2002, be extended by three (3) months, so as to expire March 11, 2003. Applicant is a small entity.

Please charge Deposit Account No. 07-1524 in the amount of $465.00 to cover the requested three month extension.

Objection to Drawings

In regard to the objection to the drawings, Figs. 1 and 2 have been labeled as PRIOR ART, as indicated on the attached copies herewith.

The Examiner is requested to approve these drawing changes.

A separate letter is also enclosed which requests approval of these drawing changes.

Further, new formal drawings of Figs. 1 and 2, with these changes incorporated therein, are also enclosed.

Prior Art Rejections

Before discussing the specific rejections, the following comments are made.

First of all, the feature of the spectrometer according to the present invention is to precisely measure the intensity of the light through the specimen, even at the intervals between the photodiodes forming the photodiode array. This is accomplished by the driving means attached to the photodiode array which drives the photodiode array in the directions of back and forth, horizontal and vertical, or up and down with reference to the direction of the light that is vertically incident on the front surface of the photodiode array.

Generally, a linear-type light sensor such as a charge coupled device (CCD), a photodiode array (PDA), etc., measures the light intensity, which is calculated based on the light intensities measured at each pixel thereof. For example, assume that there is a CCD with the 1024 pixels. As shown in attached Fig. A, assume pixel 1 has a light intensity of 10, pixel 2 has a light intensity of 20 and pixel 3 has a light intensity of 30.

As a result of these discrete measurements, the CCD can produce a profile of the light intensity, as shown in attached Fig. B. Specifically, because each pixel has a relatively small size, for example, in the dimensions of micrometers, the entire profile of the light intensity obtained by the CCD is estimated, as shown in Fig. B.

Even though the linear array type light sensor detects and measures the light intensity to form the light profile, it has a problem. Specifically, even though a light intensity profile (or distribution) P1 of the light incident onto a single pixel of the

CCD can be variable, the sensors output substantially average values V1, V2, V3 as a representative value, as shown in attached Fig. C. Further, the linear array type sensor cannot detect light incident onto the gaps or intervals between the photodiodes disposed thereon. These problems are inherently caused together with the manufacture of the sensors and cannot be essentially removed from the sensors, since the sensors must have a circuit arrangement to drive the pixels and to output the detected light therefrom.

Therefore, in order to overcome the problems of the conventional system, the spectrometer of the present invention was created to measure light intensities even at the gaps or intervals between the photodiodes, with the movement of the photodiode array by a pixel unit. Thus, even though the photodiodes are disposed on the photodiode array with a gap or interval between adjacent photodioes, if the photodiode array moves by a pixel unit in the direction of the gap or interval, then the photodiode array can detect the incident light, even at the gaps or intervals.

As shown in attached Fig. D, for example, at position m1, if all of the photodiodes 10-13 detect corresponding light intensities at the positions m11, m12, m13 and m14, with respect to the original light profile P2, and transmit the same to the signal processor, then the signal processor interpolates the transmitted signals and generates an estimated light profile P2-1 as shown in attached Fig. E.

After that, as shown in attached Fig. F, at position m2 which is spaced apart from position m1 by a pixel unit, that is, by shifting the photodiode array according to the present invention, if the photodiodes 10-13 detect corresponding light intensities at the positions, m21, m22, m23, and m24, with respect to the original light profile P2, and send the same to the signal processor, then the signal processor interpolates the transmitted light intensities and generates another estimated profile P2-2 as shown in attached Fig. G.

After processing the above-mentioned detection and process, as shown in attached Fig. H, the photodiode array can produce a profile P3 based on the estimated profiles P2-1 of Fig. F and P2-2 of Fig. G.

Here, the profile P3 obtained according to the present invention is relatively similar to the original light profile P2.

Therefore, the spectrometer of the present invention can precisely measure the change of the light intensity in a pixel dimension. For example, if the spectrometer employing a CCD with 1024 pixels can resolve light wavelengths in the range of 100 - 1100 nm, the CCD can detect information of approximately 1 nm corresponding to a size of one pixel.

Now, as to the specific prior art rejections, claims 1-5 and 11 were rejected under 35 U.S.C. §103(a) as being obvious from Applicant's admitted prior art in view of German Patent No. 3818044 to Kuehne.

The precision measurement device for large displacement of Kuehne is provided to precisely measure a relative displacement between two moving objects, which results from external causes. For example, it can be employed with an X-Y stage in the semiconductor manufacturing process for measuring a displacement of the X-Y stage. However, this is very different from the present invention and the admitted prior art, which is directed to spectrometer that detects the light intensity through a specimen from a light source.

Specifically, the drive of Kuehne merely moves the objects to be measured irrespective of their displacement amount, thereby producing the displacement of the objects. Therefore, if the drive of Kuehne is not employed, that is, the objects are not moved, Kuehne cannot detect displacement. However, with the present invention, even if the drive is not operated with the spectrometer of the present invention, the spectrometer can still detect the light intensity, and is therefore, still operative.

In other words, Kuehne is only concerned with a scale on one object and a detector on the other object, and ONLY when there is relative movement, is any detection made.

Kuehne is not concerned at all with making measurements at one position, which can be used as a valid output for measurement purposes, and then moving the object, namely, the photodiode array, and taking another measurement.

More importantly, it is pointed out that Kuehne is only directed to a measurement of relative displacement between two

objects. The present invention, on the other hand, is not concerned with this measurement at all, but rather, merely moves the objects to provide a light measurement at a different position. Thus, the purpose of the claimed drive is in order to move the photodiode array so that the light intensity at a different position can be made. This is completely contrary to Kuehne.

It is acknowledged that there are many X-Y drive devices in industry for moving two objects relative to each other. However, the present invention is not concerned with the measurement of the relative displacement of two objects, but rather, is concerned with the movement of the photodiode array to a different position in order to take a light measurement at the different position, and then combine this with the light measurement from the first position, to provide a more improved overall light measurement.

It is therefore submitted that one skilled in the art would not seek to combine the admitted prior art with Kuehne, in view of the very different teachings and purposes thereof.

As the Court of Customs and Patent Appeals has stated in In re Sponnoble, 160 U.S.P.Q. 237, 243 (CCPA 1969):

> "A patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. This is part of the `subject matter as a whole' which should always be considered in determining the obviousness of an invention under 35 USC 103 (cases cited). The Court must be ever alert not to read obviousness into an invention on the basis of the applicant's own statement; that is we must view the prior art without reading into that art applicant's

> teaching (cases cited). The issue, then, is whether the teachings of the prior art, in and of themselves and without the benefit of applicant's disclosure, make the invention as a whole, obvious."

In this case, since there is no disclosure or even a remote suggestion in the prior art of moving the photodiode array to take more than one light measurement at different positions, and since Kuehne merely relates to the relative displacement of two objects relative to each other and is only directed to their relative displacement, it is submitted that there is no logical reason to provide movement of the photodiode array to obtain multiple light measurements which are then combined, as taught by the present invention. It is submitted that such combination constitutes impermissible hindsight which has been outlawed by the courts.

Therefore, the problem of providing an inaccurate light measurement from only one light measurement is not even discussed in the admitted prior art, so that a solution to such problem would not be apparent, absent the teachings of the present application. In this regard, the determination of the problem forms part of the invention.

Further, even if Kuehne is properly combined with the admitted prior art, the present invention would still not be produced. This is because the present invention requires taking the light measurement at more than one position, and combining the light measurements to produce a more accurate light measurement. The admitted prior art fails to disclose or even

remotely suggest taking more than one light measurement, let alone combining the light measurements to produce a more accurate light measurement.

In order to make the above clearer, claim 1 has been amended to recite that the drive reciprocates the light intensity measuring arrangement within a predetermined range to at least two different positions, and the signal-processing unit reproduces a combined distribution of light intensities measured by the light intensity measuring arrangement of the spectrometer head at each of the two different positions.

In like manner, claim 11 has been amended to recite a first intensity measurement step of measuring light intensities of the incident optical spectra by the photodiode array at a first position; a step of moving the photodiode array using a drive by a distance equal to a physical interval between photodiodes of the photodiode array to a second position; a second intensity measurement step of measuring light intensities of the incident optical spectra by the photodiode array at the second position; and an intensity distribution reproduction step of transmitting spectrometric analysis data, obtained at the first and second intensity measurement steps, from the photodiode array to a signal-processing unit, and reproducing a combined light intensity distribution of the target sample by the signal-processing unit corresponding to measured light intensities at the first and second positions.

In addition, the stopper of Kuehne is used to limit the displacement of the drive and the measurement carrier is placed at a certain position between the stoppers to provide the relative measurements. However, unlike Kuehne in which the relative positions between the objects are determined by the measurements, the stopper of the present invention can determine the displacement of the photodiode array. In other words, the displacement of the array can be determined by the stopper, and in such case, the photodiode array cannot be placed at an in-between position between the stoppers. This feature has been added to new claim 12.

Therefore, it is submitted that the features of the spectrometer of the present invention would not be obvious by combining the admitted prior art and Kuehne.

Accordingly, it is respectfully submitted that the rejection of claims 1-5 and 11 under 35 U.S.C. §103(a) has been overcome.

Claims 6-8 and 10 were rejected under 35 U.S.C. §103(a) as being obvious from Applicant's admitted prior art in view of Kuehne and U.S. Patent No. 5,861,954 to Israelachvili.

The remarks made above in regard to Applicant's admitted prior art in view of Kuehne are incorporated herein by reference.

Israelachvili, however, merely provides a teaching of different drive means. Israelachvili is provided for measuring surface forces, and is therefore very different from the admitted prior art and the present claimed invention. Therefore,

Israelachvili fails to cure any of the deficiencies of Kuehne as discussed above.

Accordingly, for the same reasons given above in regard to the combination of Applicant's admitted prior art in view of Kuehne as to the rejection of claims 1 and 11, the same arguments apply to this rejection of Applicant's admitted prior art in view of Kuehne and Israelachvili.

Accordingly, it is respectfully submitted that the rejection of claims 6-8 and 10 under 35 U.S.C. §103(a) has been overcome.

Claim 9 was rejected under 35 U.S.C. §103(a) as being obvious from Applicant's admitted prior art in view of Kuehne, Israelactivili and U.S. Patent No. 3,889,166 to Scurlock.

The remarks made above in regard to Applicant's admitted prior art in view of Kuehne and Israelactivili are incorporated herein by reference.

In the first place, Scurlock merely discloses an automatic frequency control for a sandwich transducer using voltage feedback. Therefore, Scurlock fails to cure the aforementioned deficiencies of the combination of the admitted prior art and Kuehne.

Further, the displacement of amplifier of the present invention is a device amplifying the displacement not by an electrical circuit, but by a mechanical structure. Typically, it may be a lever. Therefore, the electrical amplifier 44 of

Scurlock is quite different from the displacement of the amplifier of the present invention.

Accordingly, it is respectfully submitted that the rejection of claim 9 under 35 U.S.C. §103(a) has been overcome.

Should the Examiner disagree with any of the above comments, he is requested to specifically show where in the reference or references there is support for a contrary view.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

In the event that this Paper is late filed, and the necessary petition for extension of time is not filed concurrently herewith, please consider this as a Petition for the requisite extension of time, and to the extent not tendered by check attached hereto, authorization to charge the extension fee, or any other fee required in connection with this Paper, to Account No. 07-1524.

The Commissioner is authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 07-1524.

In view of the foregoing amendments and remarks, it is

respectfully submitted that Claims 1-12 are all allowable, and early and favorable consideration thereof is solicited.

Respectfully submitted,

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Enclosures:
- Letter to Official Drartsman
- Marked up Figs. 1 and 2
- New Formal drawings of Figs. 1 and 2
- Attached Figures A-H